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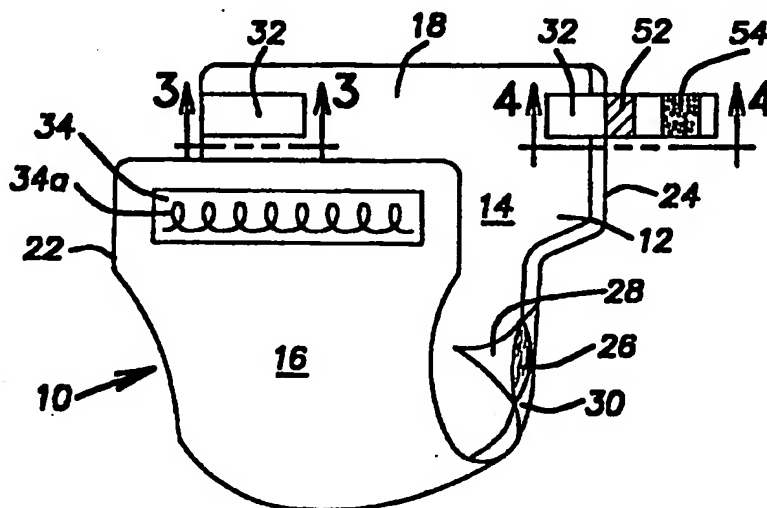
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(54) Title: DIAPERS HAVING PRECOMBINED MECHANICAL CLOSURES



(57) Abstract

A diaper (10) has a multi-layer tab (32) or tape assembly (32) arranged to form the user joint with a mechanical securement portion (54), and to provide at least one adhering or adhesive securement portion (52) for maintaining tab stability as the tab (32) is assembled with the diaper (10) and during tab (32) storage on the diaper (10) prior to tab (32) deployment. The adhering securement portion (52) includes a separation interface or separable bond portion that is separable to provide exposed non-adhesive surfaces upon tab (32) deployment to the fastening position. The separable interface or bond portion is provided by a transferable release coat that remains with and covers an otherwise exposed adhesive surface, a non-pressure sensitive adhesive or cohesive, or separable or peeling films. A central finger lift may be provided to facilitate proper layer separation and deployment of the tab (32) during use.

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1 **DIAPERS HAVING PRECOMBINED MECHANICAL CLOSURES**

2 This application is a continuation-in-part of
3 application Serial No. 673,309, filed June 28, 1996,
4 which in turn is a continuation-in-part of application
5 Serial No. 598,922, filed February 9, 1996.

6 **BACKGROUND OF THE INVENTION AND RELATED ART**

7 The present invention relates to fastener tab or
8 tape assemblies for use in closure of disposable diapers
9 or securement of other garments. The tab includes a
10 fastening element that is deployable to effect garment
11 closure with a mechanical joint. For convenience, the
12 invention is described hereinafter with respect to diaper
13 applications.

14 Diapers of the type of interest herein are widely
15 used. A typical diaper construction comprises an
16 absorbent pad or batt core enclosed in an outer liquid
17 impermeable shell or backsheet and an inner liquid
18 permeable shell or top sheet. The backsheet may comprise
19 a plastic film such as a polyethylene film or a non-woven
20 fabric laminated with such a film.

21 The fastener tab assemblies are typically fastened
22 to one end of the diaper at each lateral side or
23 longitudinal edge of the diaper in a permanent "factory
24 joint" by the diaper manufacturer using adhesives or
25 other techniques. The tabs are releasably attachable to
26 the other end of the diaper in a "user joint". The
27 attachment is releasable both to allow permanent removal
28 of the diaper and to allow unfastening to inspect the
29 diaper followed by refastening if indicated. The user
30 joint may be formed by connection of the tab to a
31 "landing member" on the diaper backsheet or directly to a
32 fibrous backsheet in the case of a non-woven backsheet
33 laminate construction. In the case of plastic film
34 shells, the landing member is often provided as a

1 reinforcing tape including exposed mechanical fastening
2 elements or a knit type fabric landing pad.

3 The fastener tab assembly includes multiple layers
4 that are secured together along their lengths with
5 varying degrees of bonding including substantially
6 permanent bond portions and separable bond portions. The
7 bond portions maintain the assembly of the tab layers and
8 proper alignment thereof during application of the tab to
9 the diaper and while the tab is in the storage position.
10 The separable bond portions are "opened" to separate
11 lengthwise segments of the tab layers during deployment
12 of the tab to form the user joint.

13 The provision of a mechanically fastening user joint
14 is advantageous since it eliminates the occurrence of
15 insufficient adhesion for effective diaper closure due to
16 contamination of adhesive surfaces by baby powder or oil,
17 or some other type of contaminant. The elimination of
18 the user adhesive bond portion is advantageous during the
19 manufacture of such tabs, and may be more convenient also
20 during diaper usage since no adhesion layer is available
21 for inadvertent attachment, e.g. to a non-woven backsheet
22 or to other accidental targets. However, such a
23 mechanically fastening user joint does not contribute to
24 the stability of the tab in the storage position if it is
25 disposed against the plastic film backsheet.

26 It is important that proper separation occurs during
27 deployment, that is, separation occurs at proper
28 interfaces with appropriate portions of layers being
29 maintained with associated layers. Accordingly, there is
30 a need to provide secure bonding for maintaining the
31 assembly prior to deployment while simultaneously
32 assuring reliable separation of layers. These objectives
33 present somewhat contrary construction requirements. It
34 is desirable to achieve both objectives in a construction

1 that is sufficiently reliable to assure a commercially
2 acceptable product without excessive costs.

3 Additional adhesive layers or portions have been
4 used in combination with mechanical fastening to provide
5 closure with an arbitrary location on a plastic film
6 backsheet upon rolling the soiled diaper for disposal and
7 also to contribute to the tab stability during storage.
8 Such combined mechanical and adhesive fasteners are
9 disclosed in U.S. Patents 4,869,724, 5,019,065 and
10 5,053,028. The additional adhesive layers in such tab
11 systems may serve to impede deployment of the tab for
12 diaper closure. A tab delamination introducing zone is
13 disclosed in US Patent 3,833,456, owned by the assignee
14 of the present application, and also in US Patent
15 5,549,591 wherein a portion of the adhesive layer is
16 deleted or rendered ineffective by masking at the
17 beginning of the intended separation location.

18 SUMMARY OF THE INVENTION

19 The present invention provides a multilayer tab or
20 tape assembly arranged to form the user joint with a
21 mechanical securement portion and to provide at least one
22 adhering or adhesive securement portion for maintaining
23 tab stability as the tab is assembled with the diaper and
24 during tab storage on the diaper prior to tab deployment.

25 The mechanical securement portion includes a
26 mechanical fastening user joint and the adhering
27 securement portion includes a separation interface or
28 separable bond portion that is separable to provide non-
29 adhesive surfaces upon tab deployment to the fastening
30 position. In the storage position, the separable bond
31 portion is adhered together along the length of the tab
32 to facilitate handling and assembly of the tab to a
33 diaper. The deployment or opening movement of the tab to

1 the diaper fastening position causes separation of the
2 separable bond portion.

3 In a first arrangement, the separable bond portion
4 is provided by a transferable release system that enables
5 the separation of an adhesive layer from an adjacent
6 layer. Upon tab deployment to the diaper fastening
7 position, the transferable release system includes a
8 release coat that remains attached to the adhesive layer
9 and masks the adhesive properties thereof. In this
10 manner, the release coat covers the now exposed surface
11 of the adhesive layer and effectively masks the adhesive
12 properties thereof to cooperate in the provision of the
13 non-adhesive exposed surfaces upon tab deployment.

14 In a second arrangement, the separable bond portion
15 is provided by a non-pressure sensitive adhesive or
16 cohesive. In this second arrangement, the non-pressure
17 sensitive adhesive or cohesive is not tacky upon
18 separation and it may remain with either the fastening
19 element or the release element, or it may fracture or
20 split between the two elements. Once again, non-adhesive
21 surfaces are exposed upon tab deployment.

22 In a third arrangement, the separable bond portion
23 is provided by separable or peelable films or film layers
24 that releasably secure the adhering tab portions together
25 along inner adjacent faces that form the separation
26 interface. The separation interface may be opened to
27 expose the two inner faces which provide non-adhesive
28 separation surfaces. Additional film layers may be
29 present, but the peelable films provide a divisible core
30 formed by a pair of films of unlike polymers of different
31 compositions. The core films are separably joined at the
32 separation interface with sufficient strength to enable
33 conventional processing of the diaper tab during tape
34 manufacture, assembly of the tab to the diaper and during
35 tab storage. Upon deployment of the tab for diaper

1 closure, the separation surfaces are "dry" and cleanly
2 separate without either being tacky.

3 In each of the foregoing arrangements and
4 embodiments, it should be appreciated that the separation
5 interface or separable bond portion is formed by
6 permanently combining or more strongly attaching adjacent
7 layers to surfaces of the diaper. That is, the
8 separation interface or separable bond requires
9 supporting layers to be more strongly adhered or attached
10 to support layers or substrates.

11 In the first and second arrangements, a central
12 fingerlift, as defined more fully below, may be provided
13 to facilitate proper layer separation and deployment of
14 the tab during use. The central fingerlift is
15 constructed to interact with the movement of the tab
16 during deployment to assure proper separation of layers.
17 The separation movement of the tab layers initially
18 encounters the fingerlift prior to any required
19 separation of adhesive or adhering interfaces of the tab.

20 The central fingerlift is not a fingerlift that is
21 intended to be grasped to manipulate the tab, but rather,
22 it comprises a combination of relative bond strengths
23 between adjacent surfaces, and/or layer configurations
24 and a separation or shear joint that enhances, if not
25 assures, desired layer separation. The fingerlift is
26 located between the mechanical and adhesive securement
27 portions, and the separation or shear joint extends
28 across the width of the adhesive securement portion. As
29 the fastening element is separated for deployment, the
30 proper separation of the adhesive securement portion is
31 promoted by the fingerlift. The adhesion between the
32 fastening element and the release element is typically
33 less than the adhesion between the release element and
34 the diaper. However, if adhesive joints between these
35 elements are presented in a single plane across the

1 direction of separation movement of the fastening
2 element, as would be the case in the absence of the
3 fingerlift in accordance with the invention, the
4 fastening element may remain bonded to the release
5 element, and the latter may be stripped from the diaper
6 during an improper release separation.

7 With respect to the direction of separation
8 movement, the joint between the fastening element and the
9 release element is recessed from the joint between the
10 release element and the diaper by the fingerlift.
11 Separation movement may be considered to freely travel to
12 the joint between the fastening element and the release
13 element, and to thereby bias the proper separation in the
14 manner a "peel crack" or "crack back" facilitates
15 separation of an adhesive label from a liner as compared
16 with separation of the label at the liner edge. Also,
17 the bond between the fastening element and securement
18 portion may be stronger than the bond between the release
19 element and the securement portion adjacent the
20 separation joint.

21 In all of the illustrated embodiments and
22 arrangements, the tab comprises a fastening element or
23 tape secured to a release element or tape at least in
24 part by the adhering or adhesive securement portion. As
25 used herein, the adhesive or adhering securement portion
26 may be formed of adhesives including pressure-sensitive
27 adhesives, non-pressure sensitive adhesives including
28 cohesives and separable polymeric films.

29 BRIEF DESCRIPTION OF THE DRAWINGS

30
31 FIG. 1 is a perspective view of a disposable diaper
32 having a tab fastener in accordance with the invention;

33 FIG. 2 is a schematic sectional view on an enlarged
34 scale of the tab fastener arranged in a flat condition,
35 the plane of the section being perpendicular to the width

1 of the tab fastener and extending along the length
2 thereof;

3 FIG. 3 is a fragmentary sectional view on an
4 enlarged scale approximately along the line 3-3 of FIG.
5 1;

6 FIG. 4 is a fragmentary sectional view on an
7 enlarged scale approximately along the line 4-4 of FIG.
8 1;

9 FIG. 5 is a schematic sectional view similar to Fig.
10 2 showing a modified tab fastener that does not include a
11 central fingerlift;

12 FIG. 6 is a fragmentary sectional view similar to
13 FIG. 2 showing a tab fastener in accordance with a second
14 embodiment of the invention, the tab being in a folded
15 condition for winding in roll form;

16 FIG. 7 is a fragmentary sectional view showing the
17 tab fastener of FIG. 6 in a storage position on a diaper;

18 FIG. 8 is a schematic sectional view showing the tab
19 fastener of FIG. 6 in a deployed condition for diaper
20 fastening;

21 FIG. 9 is a schematic view similar to FIG. 2 of
22 another arrangement and a third embodiment of a tab
23 fastener in accordance with the invention;

24 FIG. 9a is a fragmentary sectional view on an
25 enlarged scale taken along the line 9a-9a in FIG. 9;

26 FIG. 9b is a sectional view similar to FIG. 9a
27 showing a modification of the embodiment of FIG. 9;

28 FIG. 10 is a fragmentary sectional view similar to
29 FIG. 3 showing the tab fastener of FIG. 9 in a stored
30 condition on the diaper;

31 FIG. 11 is a fragmentary sectional view similar to
32 FIG. 4 showing the tab fastener of FIG. 10 in a deployed
33 condition for diaper fastening;

34 FIG. 12 is a fragmentary sectional view similar to
35 FIG. 2 showing a tab fastener in accordance with another

1 arrangement and fourth embodiment of the invention, the
2 tab being in a folded condition for winding in roll form;

3 FIG. 13 is a fragmentary sectional view showing the
4 tab fastener of FIG. 12 in a storage position on a
5 diaper; and

6 FIG. 14 is a schematic sectional view showing the
7 tab fastener of FIG. 12 in a deployed condition for
8 diaper fastening.

9 DETAILED DESCRIPTION OF THE DRAWINGS

10 Referring to FIG. 1, there is shown a disposable
11 diaper 10 in accordance with the invention. The diaper
12 10 comprises a laminate or layered assembly 12 having an
13 inside surface 14 and an outside surface 16. The diaper
14 10 is of generally rectangular configuration having a
15 first end 18 and a second end 20 connected by
16 longitudinally extending edges 22 and 24.

17 The layered assembly 12 includes a liquid absorbent
18 pad or batt core 26 enclosed within a liquid permeable
19 inner shell or top sheet 28 and a liquid impermeable
20 outer shell or backsheet 30. The core 26 may be of
21 slightly smaller dimensions than the shells 26 and 28 so
22 as to form a perimeter or border about the core 26.

23 Referring to FIGS. 1 and 2, the diaper 10 includes
24 tab or tape fastener assemblies 32 secured to the first
25 end 18 of the diaper adjacent associated longitudinal
26 edges 22 and 24. The tabs 32 are arranged to provide
27 side closure of the diaper 10 about an infant upon
28 engagement with landing member or zone 34. As described
29 in further detail below, the tabs 32 and landing member
30 34 provide mechanical closure of the diaper 10 through
31 the use of complimentary engaging mechanical elements.

32 The tab 32 has a multilayer construction including a
33 fastening element or tape 36 having an outer face 38 and
34 an opposed inner face 40. The fastening element 36 is

1 secured to a release element or tape 42 having an outer
2 face 44 and an opposed inner face 46. The elements 36
3 and 42 are secured together in lengthwise alignment and
4 adjacency along their inner faces, and have substantially
5 similar widths typical in diaper applications, e.g. 20 to
6 40mm (0.8 to 1.6"). The fastening element 36 is 62mm
7 (2.44") and the release element 42 is 42mm (1.65") long
8 in the illustrated tab 32.

9 The elongate dimensions of the elements 36 and 42
10 are referred to as their length dimensions or directions
11 herein, even though such dimensions or directions
12 generally correspond with the width or cross machine
13 direction of the films from which the elements are cut.
14 Further, locations adjacent the diaper 10 are referred to
15 as "proximal" and remote locations are designated
16 "distal". Accordingly, element 36 has a proximal end 36a
17 adjacent the diaper 10 and a distal end 36b remote of the
18 diaper 10.

19 The fastening element 36 includes a fastening
20 substrate or carrier 48 adjacent its outer face 38. The
21 substrate 48 has an outer surface 48a and an opposed
22 inner surface 48b. The substrate 48 may comprise a
23 polymeric film of conventional diaper tab polymers such
24 as polyethylene, polypropylene, blends and copolymers of
25 polyethylene and polypropylene, and polyester, the latter
26 enabling thinner gauge film to be used. Also, the
27 fastening substrate 48 may be formed of a non-woven and
28 polymer film laminate, the latter being of similar
29 polymer materials as mentioned immediately above.
30 Further, the fastening substrate 48 may be formed of
31 paper based compositions such as K 080, sold by Kimberly-
32 Clark Corporation of Neenah, Wisconsin.

33 The use of extensible or stretchable tabs to promote
34 wearer comfort through better fit and more secure
35 mounting is also known in the art. The tabs operate as

1 extensible diaper side waistbands. Examples of such
2 diaper fastening systems are disclosed in US Patents
3 4,795,456, 4,066,081, 4,051,853 and 3,800,796. To that
4 end, the fastening element 36 may be formed of extensible
5 materials as taught in US Patent 5,057,097 or a side-by-
6 side coextrusion of extensible and non-extensible
7 polymeric materials as disclosed in US Patent 3,800,796.

8 The fastening substrate 48 may be provided with a
9 conventional release finish or coating to assure reliable
10 self-winding of the stock to be used in making the tab.
11 To that end, a silicone or carbamate release coating 49
12 may be applied to the outer face 48a of the substrate 48.

13 The thickness of the fastening substrate 48 is not
14 critical. Typical diaper tab substrate film thicknesses
15 such as 4 mils (0.1mm) may be used.

16 For convenience, a fold line "F" shown in FIG. 2
17 corresponds with the location or plane of folding of the
18 tab 32 about an associated longitudinal edge 22 or 24 of
19 the diaper 10. The plane of folding extends along the
20 width of the tab 32 at substantially a right angle to the
21 tab length.

22 The fastening element 36 includes first, second and
23 third securement portions 50, 52 and 54 at its inner face
24 40. The portion 50 is about 19mm (0.75") long, the
25 portion 52 is about 15mm (0.47") long and the portion 54
26 is about 12mm (0.47") long, the latter being spaced from
27 the adjacent edge of the portion 52 by a distance of 8 to
28 12mm (0.31 to 0.47").

29 In this embodiment, the securement portion 52 is a
30 pressure-sensitive adhesive. Accordingly, the securement
31 portions 50 and 52 comprise adhesive layers secured to
32 the inner surface 48b of the substrate 48 for adhesive
33 attachment to the inner face 46 of the release element 42
34 as discussed more fully below.

1 The securement portion 54 comprises a mechanical
2 fastening member including a mechanical engaging element
3 such as a multiplicity of hooks 54b mounted on a base
4 substrate 54c as diagrammatically shown in the drawings
5 for engaging a complimentary mechanical engaging element
6 such as loops 34a provided by the landing member 34. An
7 example of a suitable mechanical engaging element is
8 Ultramate 811 which is a high density polyethylene hook
9 construction including a base sold by Velcro USA. Of
10 course, other mechanical engaging systems may be used.
11 Further, the securement portion 54 (and possibly the
12 landing member 34) may provide both mechanical and
13 adhesive attachment, the latter occurring intermediate
14 the mechanical engaging elements as taught in US Patent
15 4,946,527.

16 The securement portion 54 may be mounted to the
17 surface 48b by any convenient means such as adhesives,
18 welding, ultrasonic sealing or cold glue. Herein, the
19 use of a pressure-sensitive adhesive is contemplated. In
20 such case, the mechanical engaging member should have a
21 length slightly less than that of the mounting pressure-
22 sensitive adhesive and, if any overhang occurs, it should
23 be at the downstream side of the direction of movement of
24 the fastening element 36 during separation movement or to
25 the left as shown in FIG. 2.

26 The mounting pressure-sensitive adhesive for the
27 securement of the portion 54 may be applied to the
28 substrate 48 by a tape supplier or film converter and the
29 mechanical engaging member may be mounted to the adhesive
30 by the diaper manufacturer or an intermediate third
31 party. The subsequent assembly of the mechanical
32 engaging member facilitates the provision of the tab in
33 roll stock form since it may be more easily self-wound.
34 The additional thickness of the engaging member, e.g. 16-
35 40 mil (0.4-1 mm), tends to limit the roll length. It is

1 estimated that the added thickness reduces the manageable
2 roll length from about 750m (820 yards) to about e.g.
3 300m (328 yards).

4 The release element 42 includes a release substrate
5 56 having a mounting surface 58 at its inner face 46 and
6 an attachment portion 59 at its outer face 44. The
7 substrate 56 should be substantially non-extensible and
8 may comprise a polymeric film of conventional diaper tab
9 polymers such as polyethylene, polypropylene, and blends
10 and copolymers of polyethylene and polypropylene as well
11 as polyester which allows thinner gauge film to be used.
12 Also, the release substrate 56 may be formed of paper
13 based compositions such as Bg 40, sold by Denayere, of
14 Willebroek, Belgium.

15 The mounting surface 58 includes first and second
16 mounting surface portions 60 and 62 for receiving
17 securement portions 50 and 52, respectively, in adhesive
18 contact. The mounting surface 58 also includes a third
19 surface portion 64 remote of the portions 60 and 62.

20 The securement portion 50 and corresponding mounting
21 surface portion 60 extend from the proximal end 36a of
22 the element 36 and adjacent end of the element 42 to the
23 location of the fold line "F" as shown in FIG. 2.
24 Securement portion 52 and corresponding mounting surface
25 portion 62 extend from the fold line "F" toward the
26 distal end 36b of the element 36, but terminate together
27 short of the end of the element 42. The third surface
28 portion 64 corresponds in length with the space between
29 the termination of the portion 52 and the end of the
30 element 42. This spacing may be as small as 2mm (0.08").

31 As discussed above, the third surface portion 64 is
32 provided by the termination of the securement portion 52
33 to form a fingerlift 66 in this region including a
34 separation joint 68. In addition to the separation joint
35 68, the fingerlift 66 contemplates the relatively lower

1 peel strength of the adhesive bond between second portion
2 52 and surface portion 62 as compared with the peel
3 strength of the bond between the portion 52 and the
4 adjacent surface 48b of the fastening element 36.

5 In addition to the selected relative peel strengths
6 adjacent the portions 52 and 62, it is also desirable to
7 provide non-adhesive, non-tacky exposed surfaces upon
8 separation. To that end, the tab 32 includes a
9 transferable release coat 70 that provides separation of
10 the fastening tape 36 from the release tape 42 along a
11 separation interface 72.

12 The release coat 70 is applied at least along the
13 mounting surface portion 62 of the release tape 42 to an
14 extent necessary to transfer to the securement portion 52
15 and mask the adhesion characteristics thereof. For
16 convenience of manufacture, the release coat 70 may also
17 be applied along some or all of the mounting surface
18 portion 64. In the illustrated embodiment, the release
19 coat 70 extends across the full width of the release tape
20 42 and along the length thereof extending from the fold
21 line F to the distal end of the release tape 42.

22 As shown in Fig. 4, upon movement of the tab 32 for
23 diaper closure, the release coat 70 breaks at the
24 separation joint 68 with a first portion 70a remaining on
25 the mounting surface portion 64 of the release tape 42
26 and a second portion 70b separating with and remaining on
27 the surface of the securement portion 52 of the fastening
28 tape 36. In addition to the above described deployment
29 advantages, the fingerlift 66 also promotes the breaking
30 of the release coat 70 at the separation joint 68 and
31 proper separation between the mounting surface portion 62
32 and the adjacent surface of the release coat 70.

33 The fingerlift 66 cooperates with the release coat
34 70 to provide the proper layer separation of the
35 securement portion 52 from the release element 42 by the

1 provision of the separation joint 68 of relatively lower
2 peel strength as the fastening element 36 is peeled from
3 the release element 42. It should be appreciated further
4 that the fingerlift 66 also provides a material savings
5 due to the elimination of adhesive along the surface 64.

6 The fingerlift 66 extends across the entire width of
7 the tab 32 and may have a length as short as 2mm (0.08").
8 That is, it is only necessary that the fingerlift 66 be
9 spaced at least about 2mm (0.08") from the edge of the
10 element 42 and/or any adhesive forming the adjacent
11 portion of the securement portion 54. The maximum length
12 of the fingerlift 66 is determined by the required
13 minimum length of the securement portion 52 to reliably
14 maintain the elements 36 and 42 in alignment during tab
15 processing and assembly to the diaper. Typically, the
16 securement portion 52 length may be about 15mm (0.6") to
17 reliably provide both of these functions.

18 The portions 50 and 52 may be conventional or known
19 diaper tab adhesives such as acrylic or rubber based
20 pressure-sensitive adhesives. Preferred adhesives
21 include hot melt adhesives such as the adhesives taught
22 in US Patent 3,932,328. The latter adhesives comprise an
23 elastomeric component based on an elastomeric and
24 thermoplastic A-B-A block copolymer wherein the A blocks
25 are derived from styrene and the B blocks are derived
26 from isoprene. The elastomeric component is blended with
27 a combination of solid and liquid tackifiers.

28 The securement portions 50 and 52 may comprise the
29 same adhesive or different adhesives. It is desirable
30 that a strong permanent-type bond be formed between the
31 fastening element 36 and the release element 42 at the
32 proximal end of the tab 32 that is secured to the diaper
33 10. To that end, an aggressive adhesive is favored for
34 the securement portion 50, and, for example, a hot melt
35 rubber based adhesive, a polyurethane adhesive or a two

1 component adhesive may be used to achieve a sufficiently
2 strong bond. If a separate adhesive is used for the
3 securement portion 52, a less aggressive adhesive can be
4 used. For example, a less aggressive acrylic based
5 adhesive or hot melt adhesive may be used.

6 As noted above, the release coat 70 is transferrable
7 with the adhesive of the securement portion 52 and masks
8 the adhesive properties thereof upon tab deployment.
9 Typically, it has been found to be more efficient and
10 economical to coat two pressure-sensitive adhesives,
11 whether the same or different, to form the portions 50,
12 52, and to mask the adhesive properties of the portion 52
13 upon tab deployment using the transferrable release coat
14 70.

15 A variety of resin or polymer compositions may be
16 used to form the release coat 70 with solvent free
17 formulations being preferred for environmental reasons.
18 Particularly good results have been obtained with resins
19 designed for a relatively high degree of volume shrinkage
20 upon radiation cure. Highly acrylated resins having a
21 relatively short backbone displaying limited flexibility
22 have been found to result in stiff polymers displaying a
23 degree of shrinkage that can not be absorbed by polymer
24 tension forces. Such shrinkage is effective to weaken or
25 destroy adhesion bonds at the interface between the resin
26 and substrate and to thereby give rise to the
27 transferable and breakable characteristics.

28 With these teachings in mind, suitable formulations
29 may be derived for various adhesive and adjacent surface
30 separation interfaces. Essentially, the release coat
31 comprises a polymeric composition curable to form a
32 release film having opposed surfaces. A first surface of
33 the release coat or film is adhered to a non-adhesive
34 layer (mounting surface portion 62) of the tab by wet
35 bonding, e.g. bonding resulting from application of the

1 polymeric composition in a liquid state to the non-
2 adhesive layer followed by curing of the polymeric
3 composition. A second surface of the release film is
4 adhered to an adhesive layer (e.g. securement portion 52)
5 of the tab subsequent to the curing of the polymeric
6 composition. The separation interface 72 is provided by
7 the release film and non-adhesive layer and, upon tab
8 deployment, the exposed non-adhesive surfaces are
9 provided by the first surface of the release film and the
10 adjacent surface of the non-adhesive layer. Routine
11 experimentation will readily enable desired wet bonding
12 strengths lower than those of the adhesive layer.

13 Examples of suitable resins for making the release
14 coat 70 include acrylated polyurethane and/or polyester
15 compositions. Suitable resin compositions are available
16 from UCB Chemicals of Drogenbos, Belgium. For example,
17 Ebecryl 220 is a mixture of 70% hexafunctional aromatic
18 urethane acrylate and 30% pentaerythritol having tri- and
19 tetra- acrylate functionality. The viscosity of Ebecryl
20 220 may be reduced for coating purposes by combination
21 with Ebecryl 160 which is a trimethylolpropane ethoxy
22 triacrylate. Generally, the polyurethane and polyester
23 components are blended in a weight ratio of 30:60 to
24 60:30 to achieve a suitable processing viscosity.

25 If the release element 42, or more particularly the
26 surface portion 62, has a high energy surface, or is
27 provided with the same as by corona treatment, the resin
28 compositions may be used with formulation to a suitable
29 viscosity. If the release tape has relatively lower
30 energy surface, an acrylated silicone component may be
31 combined with the resin or resins to improve wetting of
32 the tape surface. A suitable silicone based surface
33 tension modifier is sold by Th. Goldschmidt of Essen,
34 Germany under the designation RC 704. This is a highly

1 acrylated polydimethylsiloxane polymer, and it may be
2 used in an amount ranging up to about 20% by weight.

3 The curing of the release coat 70 may be by electron
4 beam ("EB") or ultra violet ("UV") radiation. In the
5 case of the latter, an initiator may be included in the
6 release coat. Irgacure 500 by Ciba Geigy may be used as
7 a suitable photo-initiator comprising a 1:1 mixture of
8 benzofenon and 1-hydroxycyclohexyl-phenyl-ketone. A
9 typical amount of initiator is about 5% by weight.

10 In the case of a release tape 42 having a substrate
11 56 formed of cast polypropylene, white color and corona
12 treated up to 40 dynes/cm, e.g. PP-SK GLAT WEISS/cor 68
13 micron sold by Rhenolit of Germany, a suitable release
14 coating 70 is provided by a 60:40 blend of Ebecryl 220
15 and Ebecryl 160 applied at a coating weight of from 1.0
16 to 5.0 g/m². In the case of a non-corona treated cast
17 polypropylene, up to 15% by weight of the RC 704 may be
18 added to the blend and similar coating weights may be
19 used.

20 A biaxially oriented polypropylene film, white color
21 and corona treated, 40-60 microns, may be suitably
22 processed as described above at coating weights of from
23 3.5 to 7.0 g/m².

24 The resin blend forming the release coat 70 may be
25 applied to the substrate 56 by known roll coating
26 techniques such as a "5 roller" set-up using conventional
27 equipment. If UV curing is to be used, inertization of
28 the UV unit (nitrogen knife) is important. In the above
29 examples, inertization of less than 50 ppm oxygen was
30 maintained. The application of the liquid resin
31 composition forming the release coat 70 will provide
32 sufficient adhesion to the mounting surface portion 62
33 and 64 of the substrate 56.

34 The resulting release coat 70 may be used in
35 combination with conventional adhesives such as diaper

1 suitable pressure-sensitive adhesives for forming the
2 securement portion 52. The pressure-sensitive adhesive
3 may be acrylic or rubber based; preferred adhesives
4 including hot melt adhesives as taught in US Patent
5 3,932,328 as noted above.

6 The foregoing release coating and adhesive have been
7 found to provide the desired separation between the
8 surface of the substrate 56 of the release tape 42 and
9 the release coat 70. That is, the release coat 70
10 separates with the fastening tape 36 and covers the
11 securement portion 52 which would otherwise be exposed
12 for adhesive contact upon movement of the tab 100 to the
13 diaper closure position.

14 The transferable release coat 70 simplifies the
15 construction of the tab 32. As compared with a separate
16 release liner such as a film or release liner insert, the
17 release coat 70 provides the desired layer separation
18 without a separate liner piece to be inserted during
19 diaper manufacture and to be disposed of during diaper
20 use.

21 The release coat 70 may be applied to the release
22 tape 42 along the surface portion 62 and 64 using
23 conventional coating, spraying or other techniques well
24 known in the art. Thus, the release coat 70 also
25 simplifies manufacture as compared with the use of a non-
26 pressure sensitive adhesive or a cohesive. This is true
27 since the tab 32 may be prepared using conventional web
28 coating processes and techniques wherein pressure-
29 sensitive adhesives are applied to the fastening tape 36
30 and the release coat 70 is applied to the release tape
31 42. In contrast, the use of non-adhesive or cohesives
32 may involve compositions sufficiently different from
33 typical pressure-sensitive adhesive compositions to
34 prevent the use of conventional web processing equipment
35 and techniques.

1 Referring to FIG. 3, the tab 32 is shown in the
2 storage position folded along fold line "F" about the
3 longitudinal edge 22 of the diaper 10. The attachment
4 portion 59 adhesively secures the release element 42 to
5 both the inside and outside surfaces 14, 16 of the diaper
6 10, about equal lengths of the attachment portion 59
7 being secured to each surface.

8 The fastening element 36 is secured to the release
9 element 42 by securement portions 50 and 52. The
10 adhesive bond between the securement portion 50 and the
11 surface portion 60 is quite strong, effectively
12 constituting a permanent bond in this environment. The
13 adhesive bond between the securement portion 52 and the
14 surface portion 62, or more particularly, the release
15 coat 70, is adequate to maintain lengthwise alignment and
16 control of the fastening element 36 including its distal
17 end 36b during the diaper manufacture process and while
18 the tab 32 is in the storage position. Thus, the present
19 invention provides a material savings by reducing the
20 length (and expanse) of the securement portion 52 without
21 loss of lengthwise alignment and control thereof while
22 also improving the reliability of the layer separation
23 during deployment of the tab 32. Also, the adhesive
24 properties of the portion 52 upon tab deployment are
25 masked by the transferred release coat portion 70b.

26 Referring to FIG. 4, the tab 32 is shown in the
27 deployed position ready for engagement with the landing
28 member 34. A conventional fingerlift 74 may be provided
29 in a known manner at the distal end 36b of the fastening
30 element 36 to facilitate such deployment. As shown, the
31 tab 32 forms a Y-bond type attachment with the diaper 10
32 and the distal end 36b of the fastening element 36 is
33 extended for attachment of the securement portion 54 to
34 the landing member 34.

1 As illustrated in FIG. 4, the fastening element 36
2 has been pulled from the storage position, "back-on-
3 itself", in a lengthwise or separation direction. Such
4 movement is essentially unopposed along the length of the
5 surface portion 64 and fingerlift 66 until separation of
6 the securement portion 52 from the surface portion 62 is
7 required. At that point, the separation forces are
8 imposed on the separation joint 68 which presents the
9 least strong peel strength or adhesive bond resisting
10 layer separation, and continued movement causes
11 separation of the securement portion 52 together with
12 release coat 70 from the surface portion 62.

13 At the end of the deployment separation movement,
14 the securement portion 52 is substantially fully
15 separated from the portion 62 at about the plane of the
16 fold line "F" which also corresponds with the end of the
17 release coat 70. The securement portion 52 is now
18 covered by the transferred release coat portion 70b and
19 no adhesive properties thereof are exposed.

20 The tab fastener of the present invention may be
21 provided and used without the central fingerlift 66 as in
22 the tab or tape assembly 32a as shown in FIG. 5. In this
23 embodiment, similar components are identified with
24 corresponding reference numerals.

25 In the tab 32a, securement portion 52a extends to
26 the distal end of the release tape 42 so as to eliminate
27 the fingerlift 66. Proper separation upon tab deployment
28 is provided by the relative bond strengths between the
29 adjacent surfaces of the portion 52a, the release coat 70
30 and the mounting surface portion 62. Separation is
31 achieved along the separation interface 72 and the entire
32 expanse of the release coat 70 is transferred to the
33 surface of the portion 52a.

34 The tab fastener of the present invention may be
35 supplied to the diaper manufacturer in a number of

1 different configurations or stages of assembly. In all
2 cases, conventional laminating, slitting and roll
3 handling equipment may be used. Several supply
4 configurations are discussed below.

5 The tab 32 is shown as a combined fastener system
6 wherein the fastening element 36 and release element 42
7 have been combined by a tape supplier or film converter.
8 The tape supplier may also provide the securement portion
9 54 in whole or in part. For example, the tape supplier
10 may apply a suitable mounting adhesive at the location of
11 the securement 54 and the diaper manufacturer or an
12 intermediate third party may combine the particular
13 mechanical fastening element as by adhering a first
14 complimentary portion of a commercially available
15 fastener Ultramate sold by Velcro USA. Of course the
16 other complimentary portion of the fastener would be
17 secured to the diaper backsheet or landing member.

18 It is also possible to supply the tab 32 as a two
19 tape system consisting of the fastening element 36, with
20 or without securement portion 54, and release element 42.
21 Once again, the diaper manufacture or an intermediate
22 third party may complete the mechanical fastener as
23 described above. The elements 36 and 42 may be sold as
24 separate but complete constructions, and the two tapes
25 may be applied to the diaper by the diaper manufacturer
26 using only conventional laminating and slitting roll
27 processing equipment.

28 Referring to FIGS. 6, 7 and 8, a tab fastener 80 in
29 accordance with a second embodiment is shown. For
30 convenience of illustration, corresponding elements are
31 similarly numbered with the addition of a prime
32 designation. It should be understood that the assembly
33 and proportions of the corresponding elements may vary
34 slightly in each of the embodiments, but the essential
35 functions of the elements are similar and the tab

1 fasteners similarly enjoy the improvements of the
2 invention.

3 The tab fastener 80 is of conventional Y-bond
4 construction providing separate tape attachments to the
5 inside and outside of the diaper to form the factory
6 bond. Referring to FIG. 6, the tab 80 is shown in its
7 roll stock configuration, that is, the position of the
8 elements forming the tab when wound in roll form as a
9 precombined tab or tape system sold by a tape supplier or
10 film converter. As shown, elements 36' and 42' are
11 secured together. The tab 80 is applied to the
12 longitudinal edge of the diaper 10 as shown in Fig. 7.
13 To that end, the tab 80 includes a fastening element or
14 tape 36' for engaging the outside surface 16 of the
15 diaper 10 and a release tape 42' for engaging the inside
16 surface 14 of the diaper 10. More particularly, the
17 fastening element 36' includes a first securement portion
18 50' adapted to engage the backsheet 30 of the diaper 10
19 and the release element 42' includes an attachment
20 portion 59' adapted to engage the top sheet 28 of the
21 diaper 10. A small extent of the attachment portion 59'
22 and the securement portion 50' engage with each other to
23 secure the two elements together in the Y-bond
24 configuration at the longitudinal edge 24 of the diaper
25 10.

26 The fastening element 36' also includes a second
27 securement portion 52' for engaging the release tape
28 mounting surface portion 62'. The fastening element 36'
29 further includes a third securement portion 54'
30 comprising a mechanical engaging element such as a
31 multiplicity of hooks 54b' mounted on a base substrate
32 54'c similar to the first tab embodiment described above.

33 The releasable engagement between the portion 52'
34 and the mounting surface portion 62', or more
35 specifically, the release coat 70', assures the stability

1 of the distal end 36b' of the substrate 36' during tab
2 storage on the diaper 10. The release coat 70' assures
3 that the bond strength between the securement portion 52'
4 and the mounting surface 62' is less than that between
5 the attachment portion 59' and the top sheet 28 of the
6 diaper 10. More particularly, the release coat 70'
7 provides a separation interface 72' between the portion
8 62' and the release coat 70' so that the latter remains
9 fixed to the portion 52' upon tab deployment.

10 The portion 52' extends towards the distal end 36b'
11 of the element 36' and ends short of the securement
12 portion 54'. As most clearly shown in FIG. 7, the
13 securement portion 52' in the storage position extends
14 along the mounting surface portion 62' and terminates at
15 the mounting surface portion 64' to form a fingerlift 66'
16 and a separation joint 68'. Accordingly, the securement
17 portion 52' extends along the mounting surface portion of
18 the element 42' and terminates at the adjacent surface
19 portion 64' so that the latter is free of adhesive and
20 attachment to the fastening element 36'. The fingerlift
21 66' is similar in construction and operation to the
22 fingerlift 66. Upon tab deployment as shown in Fig. 8,
23 the release coat 70' breaks at separation joint 68'
24 leaving release coat portion 70a' on the portion 64' of
25 the release coat 42' and release coat portion 70b' on the
26 securement portion 52' of the fastening tape 36'.

27 The fingerlift 66' also provides a material savings
28 in respect to decreased amount of adhesive surface. In
29 addition, the fingerlift 66' enables the length of the
30 release element 42' to be decreased as compared to the
31 length required in a similar tab construction not
32 including a central fingerlift in accordance with the
33 invention.

34 As in the first embodiment, the tab fastener 80 may
35 be provided without a fingerlift 66' by extension of the

1 length of the increasing the length of the portion 52' or
2 otherwise terminating the distal ends of the portion 52'
3 and 62' in a common plane. The tab 80 may also be
4 supplied to a diaper manufacturer as a two tape system
5 comprising the completed elements 36' and 42'. The
6 precombined or two tape systems may be supplied with or
7 without the mechanical fasteners. In the latter case,
8 the mechanical fasteners such as hooks may be secured to
9 the tab by a diaper manufacturer or an intermediate third
10 party.

11 Referring to FIGS. 9 and 9a, a tab fastener 90 in
12 accordance with a third embodiment of the invention is
13 shown. For convenience of illustration, corresponding
14 elements are similarly numbered with the addition of a
15 double prime (') designation.

16 The tab fastener 90 has a Y-bond construction
17 similar to that of tab fastener 32 of the first
18 embodiment. However, it should be understood that
19 separate tape attachments to the inside and outside of
20 the diaper to form the factory bond may be used as shown
21 in the tab fastener 80.

22 The tab 90 includes a fastening element or tape 36''
23 having an outer face 38'' and an inner face 40''. The
24 element 36'' is secured to a release tape 42'' having an
25 outer face 44'' and an inner face 46''. The elements
26 36'' and 42'' are secured together in lengthwise
27 alignment and adjacency along their inner faces, and have
28 similar widths as described above in connection with the
29 first embodiment.

30 The fastening element 36'' includes a fastening
31 substrate or carrier 48'' adjacent its outer face 38''.
32 The substrate 48'' has an outer surface 48a'' and an
33 opposed inner surface 48b''. The substrate 48'' may be
34 provided with a release finish or coating 49'' to assure

1 reliable self-winding of the stock to be used in making
2 the tab.

3 For convenience, a fold line "F" shown in FIG. 9
4 corresponds with the location or plane of folding of the
5 tab 90 about an associated longitudinal edge 22 or 24 of
6 the diaper 10. The plane of folding extends along the
7 width of the tab 90 at substantially a right angle to the
8 tab length.

9 The fastening element 36'' includes first, second
10 and third securement portions 50'', 52'' and 54'' at its
11 inner face 40''. The portions 50'' and 54'' are similar
12 to the portions 50 and 54, respectively, as described in
13 connection with the tab 32 of the first embodiment. The
14 portion 52'' is similar to the portion 52 in that it also
15 maintains the alignment of the elements of the tab 90
16 during diaper assembly and while the tab is in the
17 storage condition.

18 The release element 42'' includes a release
19 substrate 56'' having a mounting surface 58'' at its
20 inner face 46'' and an attachment portion 59'' at its
21 outer face 44''. The attachment portion 59'' mounts the
22 tab 90 to the diaper 10 in the storage position as shown
23 in FIG. 10. The release element 42'' generally
24 corresponds with the element 42 described above.
25 However, the release coat 70 is not required and such has
26 been omitted herein since the securement portion 52'' is
27 not a pressure-sensitive adhesive.

28 The mounting surface 58'' includes first and second
29 mounting surface portions 60'' and 62'' for receiving
30 securement portions 50'' and 52'', respectively, in
31 adhesive contact. The mounting surface 58'' also
32 includes a third surface portion 64'' remote of the
33 portions 60'' and 62''.

34 The securement portion 50'' and associated mounting
35 surface portion 60'' are similar to the corresponding

1 elements in the tab 32. In the tab fastener 90, the
2 securement portion 52'' comprises one or more stripes or
3 drops of adhesive located adjacent the distal side of the
4 fold line "F". The corresponding mounting surface
5 portion 62'' may extend from the fold line "F" toward the
6 distal end 36b'' of the element 36'' and at least
7 corresponds in length with the major length dimension or
8 extent of the stripe or drop shaped securement portion
9 52''.

10 The portion 52'' comprises a single stripe of
11 adhesive having a thickness about equal to the thickness
12 of the portion 50''. As determined by the preferences of
13 the diaper manufacturer, the width of the portion 52''
14 may be equal to from about 1mm (0.04") to about the width
15 of the fastening element 36''. The length of the portion
16 52'' may be equal to from about 1mm (0.04") to the length
17 of the release element 42" on the distal side of the fold
18 line F less about 2mm (0.08") to allow for the surface
19 portion 64". The same dimensional considerations also
20 apply to the overall size of the portion 52'' when it is
21 formed of two or more stripes or drops of adhesive.

22 As in the first embodiment, the securement portion
23 52'' is spaced from or terminates short of the end of the
24 element 42''. The third surface portion 64'' corresponds
25 in length with the space between the termination of the
26 portion 52'' and the end of the element 42''. This
27 spacing may be as small as 2mm (0.08").

28 The cross-section of the stripe configuration of the
29 securement portion 52'' is shown in FIG. 9a. As noted
30 above, the securement portion 52'' may be provided in a
31 drop or dollop configuration as shown in FIG. 9b.

32 As discussed above, the third surface portion 64''
33 is provided by the termination of the securement portion
34 52'' to form a fingerlift 66'' in this region including a
35 separation joint 68''. In addition to the separation

1 joint 68'', the fingerlift 66'' contemplates the
2 relatively lower peel strength of the adhesive bond
3 between second portion 52'' and surface portion 62'' as
4 compared with the peel strength of the bond between the
5 portion 52'' and the adjacent surface 48b'' of the
6 fastening element 36''. Accordingly, a release coating
7 or an adhesive detackifier or deadening agent can be used
8 between the adjacent faces of the portion 52'' and the
9 adjacent surface 62''. The fingerlifts 66'' and 66
10 operate in similar manners.

11 The securement portion 52'' may be a non-pressure
12 sensitive adhesive or a cohesive suitable for use in a
13 diaper tab. The adhesive or cohesive should be easily
14 applied and result in a bond sufficient to maintain the
15 elements 36'' and 42'' aligned in their adhered position
16 during diaper manufacture and during tab storage on the
17 diaper prior to deployment for diaper closure. It is
18 also necessary that the adhesive or cohesive be separable
19 from at least one of the adjacent surfaces (e.g. 62'') or
20 fracture by the deployment movement within the
21 requirements of the fingerlift 66''. Herein, a
22 separation interface 72'' is provided between the surface
23 portion 62'' and the portion 52''.

24 The non-pressure sensitive adhesive or cohesive of
25 the portion 52'' may be applied to the tab 90 using
26 conventional solvent or hot techniques, e.g., by use of a
27 hot melt nozzle, a hot melt die or a roll coater. Useful
28 non-pressure sensitive adhesives include hot melt
29 adhesives based on polyolefin resins and cold seal
30 adhesives applied from a solvent. A commercially
31 available suitable hot melt adhesive is sold with the
32 designation Crodamelt by the Croda company in Kapellen,
33 Belgium. Suitable cohesives are disclosed in U.S. Patent
34 5,085,655. Since the cohesive is applied hot or in
35 solvent form, it bonds with the mounting surfaces 62'' of

1 the release element 42'' and the inner surface 48b'' of
2 the fastening element 36''. After the bond is broken
3 during tab deployment, the cohesive coheres to itself,
4 but does not adhere to other materials.

5 Following deployment of the tab fastener 90 to the
6 diaper closure position as shown in FIG. 11, the
7 separated or exposed surface of the portion 52'' is a
8 non-pressure sensitive, not tacky, and does not provide
9 adhesive closure with the diaper. As noted above, the
10 portion 52'' is formed of a non-pressure-sensitive
11 adhesive and, after its adhesive bond with the surface
12 62'' is broken during tab deployment, the exposed surface
13 of the portion 52'' does not provide a further adhesive
14 bond as in the case of the portion 52.

15 As shown in FIG. 11, the mounting surface portion
16 62'' of the release element 42'' may include a
17 conventional or non-transferrable release coat (e.g. a
18 silicone or carbamate coat extending along its surface,
19 not shown) and the securement portion 52'' remains on the
20 fastening element 36'' upon tab deployment. However, it
21 is not necessary to use such a release coat on the
22 mounting surface portion 62'' and, upon tab deployment,
23 the non-pressure sensitive adhesive or the cohesive
24 portion 52'' may remain with either of the elements 36''
25 and 42'' depending upon the surfaces of the elements or
26 fracture with parts of the portion 52'' remaining on each
27 of the elements.

28 Referring to Figs. 12, 13 and 14, a tab or tape
29 fastener 100 in accordance with a fourth embodiment of
30 the invention is shown. The construction of the tab 100
31 is similar to that of the tab 80 shown in Figs. 6-8 and
32 includes a corresponding fastening element or tape 36'.
33 For convenience, like reference numerals are used in
34 connection with like parts in the two embodiments.

1 The tab 100 includes a release element or tape 102
2 having an outer face 104 and an inner face 106. The
3 elements 36' and 102 are secured together in lengthwise
4 alignment and adjacency along their inner faces.
5 Further, the elements 36' and 102 have substantially
6 similar widths typical in diaper applications, e.g. 20 to
7 40mm (0.8" to 1.6"). The fastening element 36' is 62mm
8 (2.44") and the release element 102 is 42mm (1.65") long
9 in the illustrated tab 100.

10 The release element 102 includes a pair of
11 releasably joined film layers comprising a release
12 substrate 108 releasably secured to a separable film 110
13 along a separation interface 112. The substrate 108 and
14 film 110 cooperate to form a divisible core that may be
15 separated along interface 112. As described in detail
16 below, the separable film 110 operates to mask or deaden
17 the adhesive the adhesive surface of the securement
18 portion 52' of the fastening tape 36' in the same manner
19 as the release coat 70' in the tab 80.

20 The tab fastener 100 is of conventional Y-bond
21 construction providing separate tape attachments to the
22 inside and outside of the diaper to form the factory
23 bond. To that end, the fastening tape 36' is arranged to
24 engage the outside surface 16 of the diaper 10 and the
25 release element 102 is arranged to engage the inside
26 surface 14 of the diaper 10. More particularly, the
27 fastening element 36' includes a first securement portion
28 50' adapted to engage the backsheet 30 of the diaper 10
29 and the release element 102' includes an attachment
30 portion 114 adapted to engage the top sheet 28 of the
31 diaper 10. A small extent of the attachment portion 114
32 and the securement portion 50' engage with each other to
33 secure the two elements together in the Y-bond
34 configuration at the longitudinal edge 22 or 24 of the
35 diaper 10.

1 The fastening element 36' also includes a second
2 securement portion 52' for engaging the release tape
3 mounting surface portion 116. In this embodiment, the
4 release element 102 ends at the distal extremity of the
5 securement portion 52'. A separation joint 118 is
6 provided by the exposed or distal edge of the separation
7 interface 112, and the distal ends or extremities of the
8 release element 102 including the release substrate 108
9 and the separable film 110 together with the distal end
10 of the securement portion 52' are in a common plane with
11 the separation joint 118.

12 The release substrate 108 and separable film 110 may
13 be extruded together with the formation of separation
14 interface 112 therebetween as taught in US Patent
15 4,925,714, also owned by the assignee herein. Upon
16 separation along the interface 112, the exposed surfaces
17 are "dry" and cleanly separate without either being
18 tacky.

19 Suitable polymer extrudates for the substrate 108
20 and film 110 include polyethylene and polypropylene. The
21 interfacial peel strength at the interface 112 is a
22 function of several parameters, including, among others,
23 the identities of the two dissimilar thermoplastic
24 layers, the presence or absence of pigments in one or
25 both films, the pressure exerted by, and the temperature
26 of, the nip rollers, and thermal aging of the coextruded
27 layers. While several factors can play a role in
28 providing a desired peel strength, that desired peel
29 strength can be achieved through routine experimentation.
30 Peel strengths of less than about 50 newtons/meter are
31 possible using this technique, and preferred peel
32 strengths are in the range of from about 30 to 200
33 newtons/meter.

34 The adhesive compositions to which the substrate 108
35 and the film 110 are secured should have peel strengths

1 exceeding those of the interfacial peel strength along
2 the separation interface 112. Suitable adhesives
3 including those mentioned above and/or described in US
4 Patent 4,925,714 may exhibit an adhesive force of about
5 15 to about 50 ounces per inch (about 170 to about 560
6 g/cm) of adhesive width in the 180° peel adhesive test of
7 the P.S.T.C. test #1, with a 20 minute dwell time. More
8 preferably, the peel strength is about 20 to about 45
9 ounces per inch (about 220 to about 450 g/cm).

10 As particularly shown in Fig. 14, deployment of the
11 tab 100 to the diaper closure position causes separation
12 along the separation interface 112 with exposure of
13 surface 110a of the separable film 110 and surface 108a
14 of the substrate 108. The surfaces 110a and 108a are dry
15 and do not display tackiness.

16 In the preparation of the tabs or tapes of the
17 present invention, the adhesive layers such as the
18 securement and attachment portions may be applied to
19 suitable substrate materials using extrusion coating, die
20 coating and/or roll coating techniques as well as the hot
21 melt nozzle technique noted above for the portion 52''.
22 The adhesive layers may be of conventional diaper tab
23 thickness, such as about 30 microns (0.1 mil) thick, and
24 extend across the full width of the substrate of the tab
25 or tape and may be in the form of one or more stripes or
26 drops as used in the portion 52''. The tabs may be
27 formed of adhesive coated film or stock materials using
28 known laminating and slitting techniques. The separable
29 or peelable film constructions shown in connection with
30 the tab 100 may be made using coextrusion techniques and
31 multi-manifold dies as described in US Patents 4,197,069
32 and 4,152,387.

33 The invention is not restricted to the slavish
34 imitation of each and every detail set forth above.
35 Obviously, devices may be provided which change,

- 1 eliminate, or add certain specific details without
- 2 departing from the invention.

WHAT IS CLAIMED IS:

- 1 1. A diaper having fastening tabs that each include
2 multiple layers, the tab being movable from a storage
3 position on the diaper to a deployed position for diaper
4 closure,
5 said diaper including a layered assembly having
6 inside and outside major surfaces extending between a
7 first end and a second end and connected by longitudinal
8 edges, one of said tabs being secured to said diaper at
9 each longitudinal edge adjacent said first end, said
10 diaper also including a landing zone on said outside
11 surface at said second end of said diaper,
12 each of said tabs including a fastening element and
13 a release element, said fastening and release elements
14 each having a length and being adapted to be disposed in
15 close adjacency and alignment along their lengths in said
16 storage position,
17 said fastening element including at least one
18 securement portion extending along its length for
19 securing the fastening element to the release element in
20 the storage position,
21 said release element including at least one mounting
22 surface for receiving said at least one securement
23 portion and cooperating therewith to form a separation
24 interface, said tab layers being separable along said
25 separation interface upon tab deployment for diaper
26 closure,
27 movement of said tab to said deployed position
28 including peeling said fastening element from said
29 release element in a lengthwise direction along said at
30 least one securement portion and separating said
31 fastening element from said release element along said
32 separation interface to expose opposed non-adhesive
33 surfaces.

1 2. A diaper as in claim 1, wherein said tab
2 includes a transferrable release coat for providing said
3 separation interface, said release coat cooperating with
4 said at least one securement portion and said at least
5 one mounting surface to secure said fastening element to
6 said release element in the storage position.

1 3. A diaper as in claim 2, wherein said release
2 coat comprises a polymeric composition curable to form a
3 release film having opposed surfaces, a first surface of
4 said release film being adhered to a non-adhesive layer
5 of said tab by wet bonding resulting from application of
6 the polymeric composition in a liquid state to the non-
7 adhesive layer followed by curing of the polymeric
8 composition, and a second surface of said release film
9 being adhered to an adhesive layer of said tab subsequent
10 to the curing of said polymeric composition, said
11 separation interface being provided by said release film
12 and said non-adhesive layer and said exposed non-adhesive
13 surfaces being provided by said first surface of said
14 release film and an adjacent surface of said non-adhesive
15 layer upon deployment of said tab.

1 4. A diaper as in claim 3, wherein said polymeric
2 composition shrinks to a sufficient degree upon curing to
3 cause the peel strength of the wet bonding to said non-
4 adhesive surface to be less than the peel strength of
5 said second surface to said adhesive layer.

1 5. A diaper as in claim 4, wherein said polymeric
2 composition comprises an acrylated polyurethane resin.

1 6. A diaper as in claim 4, wherein said polymeric
2 composition comprises a blend of an acrylated
3 polyurethane resin and an acrylated polyester resin, said

4 polyurethane and polyester resins being blended in a
5 weight ratio of 30:60 to 60:30.

1 7. A diaper as in claim 6, wherein said acrylated
2 polyurethane resin is a mixture of 70% hexafunctional
3 aromatic urethane acrylate and 30% pentaerythritol having
4 tri- and tetra- acrylate functionality, and said
5 acrylated polyester resin is a trimethylolpropane ethoxy
6 triacrylate.

1 8. A diaper as in claim 2, wherein said release
2 coat separates from said at least one mounting surface of
3 said release element and remains fixed to said at least
4 one mounting portion of said fastening element upon tab
5 deployment, said mounting portion comprises a pressure-
6 sensitive adhesive and said release coat masks the
7 adhesive properties of said pressure-sensitive adhesive.

1 9. A diaper as in claim 2, wherein said fastening
2 element is bonded to said release element by said at
3 least one securement portion with a first bond strength
4 between said fastening element and securement portion and
5 a second bond strength between said at least one mounting
6 surface and said securement portion, said bond strengths
7 being of sufficient strength to maintain said fastening
8 and release elements in said close adjacency and
9 alignment during assembly of said fastening tabs to said
10 diaper and during storage of said fastening tab in said
11 storage position.

1 10. A diaper as in claim 1, wherein said at least
2 one securement portion comprises a non-pressure sensitive
3 adhesive layer or a cohesive layer joined to said at
4 least one mounting surface to secure said fastening
5 element to said release element in the storage position,

6 said non-pressure sensitive adhesive or cohesive layer
7 cooperating with said at least one mounting surface to
8 provide said separation interface.

1 11. A diaper as in claim 10, wherein said non-
2 pressure sensitive adhesive or cohesive layer includes a
3 first surface adhered to mounting surface of said release
4 element, and said non-pressure sensitive adhesive or
5 cohesive layer first surface and said at least one
6 mounting surface cooperating to provide said exposed non-
7 adhesive surfaces upon tab deployment.

1 12. A diaper as in claim 10, wherein said at least
2 one securement portion upon deployment of said fastening
3 element remains bonded to said fastening element, remains
4 bonded to said release element or fractures with separate
5 parts thereof remaining bonded to said fastening element
6 and to said release element.

1 13. A diaper as in claims 1 or 10, further
2 including a central fingerlift to enhance layer
3 separation, said release element including said at least
4 one mounting portion and an adjacent surface portion that
5 is free of said securement portion and substantially
6 unattached to said fastening element, said at least one
7 securement portion terminating at a separation joint to
8 form said fingerlift with said adjacent mounting surface
9 portion, movement of said tab to said deployed position
10 also including peeling said fastening element from said
11 release element in said lengthwise direction across said
12 adjacent surface portion.

1 14. A diaper as in claim 13, wherein said fastening
2 element has a proximal end permanently secured to said
3 diaper and extends lengthwise to a distal end adapted to

4 carry a mechanical means for closing the diaper in a user
5 joint, said at least one securement portion being located
6 remote of the proximal end of said fastening element,
7 said mechanical means being located at the distal end of
8 said fastening element and said central fingerlift being
9 located at a lengthwise intermediate location between
10 said at least one securement portion and said mechanical
11 means.

1 15. A diaper as in claim 14, wherein said release
2 element includes an attachment portion on a side thereof
3 remote of said mounting surface, and said release element
4 is folded about an associated one of said longitudinal
5 edges of said diaper and secured by said attachment
6 portion to said inside and outside surfaces of said
7 diaper.

1 16. A diaper as in claim 15, wherein said
2 mechanical means comprise a plurality of hook fasteners
3 respectively secured to each of said tabs.

1 17. A diaper as in claim 15, wherein said fastening
2 element comprises a substrate film selected from the
3 group consisting of polymeric film, paper and non-woven
4 laminated to polymeric film.

1 18. A diaper as in claim 1, wherein said tab
2 includes first and second film layers having remote outer
3 faces and adjacent inner faces releasably joined together
4 along said separation interface, said film layer outer
5 faces being respectively secured to said fastening and
6 release elements, and, upon tab deployment, said inner
7 faces providing said non-adhesive surfaces.

1 19. A diaper as in claim 18, wherein said first and
2 second film layers are formed of unlike polymers.

1 20. A diaper as in claim 18, wherein said first and
2 second film layers are formed of film forming polymers
3 selected from the group consisting of polyethylene and
4 polypropylene.

1 21. A diaper having fastening tabs that each
2 include multiple layers, said tab being movable from a
3 storage position on the diaper to a deployed position for
4 diaper closure,

5 said diaper including a layered assembly having
6 inside and outside major surfaces extending between a
7 first end and a second end and connected by longitudinal
8 edges, one of said tabs being secured to said diaper at
9 each longitudinal edge adjacent said first end, said
10 diaper also including a landing zone on said outside
11 surface at said second end of said diaper,

12 each of said tabs including a fastening element and
13 a release element, each of said elements having a length
14 and opposed faces including an inner face and an outer
15 face, said inner faces of said elements being disposed in
16 close adjacency and alignment along the lengths of the
17 elements,

18 said fastening element inner face including first
19 and second securement portions disposed along its length
20 for securing the fastening element to said inner face of
21 said release element in the storage position and a third
22 securement portion for diaper closure in the deployed
23 position, said third securement portion comprising a
24 first mechanical fastening element for engagement with a
25 second mechanical element provided by said landing zone,

26 said release element inner face including a mounting
27 surface having first and second mounting portions for

28 respectively receiving said first and second securement
29 portions of said fastening element, said release element
30 outer face including an attachment portion for securing
31 said tab to the diaper,
32 said first and second securement portions engaging
33 said first and second mounting portions of said mounting
34 surface for securing said fastening element to said
35 release element during assembly of the tab with the
36 diaper and for maintaining said fastening element and
37 release element in lengthwise adjacency while said tab is
38 in said storage position on the diaper,
39 said second securement and mounting portions
40 cooperating to form a separation interface, said tab
41 layers being separable along said separation interface
42 upon tab deployment for diaper closure,
43 movement of said tab to said deployed position for
44 diaper closure including peeling said fastening element
45 from said release element in a lengthwise separation
46 direction along said second securement portion and
47 separating said fastening element from said release
48 element along said separation interface to expose non-
49 adhesive surfaces.

1 22. A diaper as in claim 21, wherein said fastening
2 element is bonded to said release element by said second
3 securement portion with a first bond strength between
4 said fastening element and second securement portion and
5 a second bond strength between said second mounting
6 surface and said second securement portion, said bond
7 strengths being of sufficient strength to maintain said
8 fastening and release elements in said close adjacency
9 and alignment during assembly of said fastening tabs to
10 said diaper and during storage of said fastening tab in
11 said storage position.

1 23. A diaper as in claim 22, wherein said first
2 bond strength is greater than said second bond strength.

1 24. A diaper as in claim 21, wherein said fastening
2 element has a proximal end permanently secured to said
3 diaper and extends lengthwise to a distal end adapted to
4 be secured to said diaper by engagement of said first and
5 second mechanical fastening elements during diaper
6 closure, said first portion being located at the proximal
7 end of said fastening element and said third securement
8 portion being located at the distal end of said fastening
9 element with said second securement portion therebetween,
10 and said central fingerlift being located at a lengthwise
11 intermediate location between said second and third
12 securement portions.

1 25. A diaper as in claim 21, wherein said tab
2 includes a transferrable release coat for providing said
3 separation interface, said release coat cooperating with
4 said second securement portion and said second mounting
5 surface to secure said fastening element to said release
6 element in the storage position.

1 26. A diaper as in claim 25, wherein said release
2 coat comprises a polymeric composition curable to form a
3 release film having opposed surfaces, a first surface of
4 said release film being adhered to said second mounting
5 surface portion of said release element by wet bonding
6 resulting from application of the polymeric composition
7 in a liquid state to the non-adhesive layer followed by
8 curing of the polymeric composition, and a second surface
9 of said release film being adhered to an adhesive layer
10 of said second mounting portion of said fastening element
11 subsequent to the curing of said polymeric composition,
12 said separation interface being provided by said release

13 film and said second mounting surface portion of said
14 release element and said exposed non-adhesive surfaces
15 being provided by said first surface of said release film
16 and said second mounting surface portion of said release
17 element upon deployment of said tab.

1 27. A diaper as in claim 26, wherein said polymeric
2 composition shrinks to a sufficient degree upon curing to
3 cause the peel strength of the wet bonding to said second
4 mounting surface portion of said release element to be
5 less than the peel strength of said second surface of
6 said release film to said adhesive layer of said second
7 mounting surface portion of said release element.

1 28. A diaper as in claim 21, wherein said second
2 securement portion comprises a non-pressure sensitive
3 adhesive or cohesive layer joined to said second mounting
4 surface to secure said fastening element to said release
5 element in the storage position, said non-pressure
6 sensitive adhesive or cohesive layer cooperating with
7 said second mounting surface to provide said separation
8 interface.

1 29. A diaper as in claims 21 or 28, further
2 including a central fingerlift to enhance layer
3 separation, said release element including said second
4 mounting portion and an adjacent surface portion that is
5 free of said securement portion and substantially
6 unattached to said fastening element, said second
7 securement portion terminating at a separation joint to
8 form said fingerlift with said adjacent mounting surface
9 portion, movement of said tab to said deployed position
10 also including peeling said fastening element from said
11 release element in said lengthwise direction across said
12 adjacent surface portion.

1 30. A diaper as in claim 21, wherein said tab
2 includes first and second film layers having remote outer
3 faces and adjacent inner faces releasably joined together
4 along said separation interface, said film layer outer
5 faces being respectively secured to said fastening and
6 release elements, and, upon tab deployment, said inner
7 faces providing said non-adhesive surfaces.

1 31. A fastener tab for use in closure of a diaper,
2 said fastener tab comprising multiple layers, said tab
3 being movable from a storage position on the diaper to a
4 deployed position for diaper closure,
5 said tab comprising a fastening element and a
6 release element, said fastening and release elements each
7 having a length and being adapted to be disposed in close
8 adjacency and alignment along their lengths in said
9 storage position,
10 said fastening element including at least one
11 securement portion extending along its length for
12 securing the fastening element to the release element in
13 the storage position,
14 said release element including at least one mounting
15 surface for receiving said at least one securement
16 portion and cooperating therewith to form a separation
17 interface, said tab layers being separable along said
18 separation interface upon tab deployment for diaper
19 closure,
20 movement of said tab to said deployed position
21 including peeling said fastening element from said
22 release element in a lengthwise direction along said at
23 least one securement portion and separating said
24 fastening element from said release element along said
25 separation interface to expose opposed non-adhesive
26 surfaces.

1 32. A diaper as in claim 31, wherein said tab
2 includes a transferrable release coat for providing said
3 separation interface, said release coat cooperating with
4 said at least one securement portion and said at least
5 one mounting surface to secure said fastening element to
6 said release element in the storage position.

1 33. A diaper as in claim 32, wherein said release
2 coat comprises a polymeric composition curable to form a
3 release film having opposed surfaces, a first surface of
4 said release film being adhered to a non-adhesive layer
5 of said tab by wet bonding resulting from application of
6 the polymeric composition in a liquid state to the non-
7 adhesive layer followed by curing of the polymeric
8 composition, and a second surface of said release film
9 being adhered to an adhesive layer of said tab subsequent
10 to the curing of said polymeric composition, said
11 separation interface being provided by said release film
12 and said non-adhesive layer and said exposed non-adhesive
13 surfaces being provided by said first surface of said
14 release film and an adjacent surface of said non-adhesive
15 layer upon deployment of said tab.

1 34. A diaper as in claim 33, wherein said
2 polymeric composition comprises a blend of an acrylated
3 polyurethane resin and an acrylated polyester resin, said
4 polyurethane and polyester resins being blended in a
5 weight ratio of 30:60 to 60:30.

1 35. A diaper as in claim 34, wherein said acrylated
2 polyurethane resin is a mixture of 70% hexafunctional
3 aromatic urethane acrylate and 30% pentaerythritol having
4 tri- and tetra- acrylate functionality, and said

5 acrylated polyester resin is a trimethylolpropane ethoxy
6 triacrylate.

1 36. A diaper as in claim 32, wherein said release
2 coat separates from said at least one mounting surface of
3 said release element and remains fixed to said at least
4 one mounting portion of said fastening element upon tab
5 deployment, said mounting portion comprises a pressure-
6 sensitive adhesive and said release coat masks the
7 adhesive properties of said pressure-sensitive adhesive.

1 37. A diaper as in claim 32, wherein said fastening
2 element is bonded to said release element by said at
3 least one securement portion with a first bond strength
4 between said fastening element and securement portion and
5 a second bond strength between said at least one mounting
6 surface and said securement portion, said bond strengths
7 being of sufficient strength to maintain said fastening
8 and release elements in said close adjacency and
9 alignment during assembly of said fastening tabs to said
10 diaper and during storage of said fastening tab in said
11 storage position.

1 38. A diaper as in claim 31, wherein said at least
2 one securement portion comprises a non-pressure sensitive
3 adhesive or cohesive layer joined to said at least one
4 mounting surface to secure said fastening element to said
5 release element in the storage position, said non-
6 pressure sensitive adhesive or cohesive layer cooperating
7 with said at least one mounting surface to provide said
8 separation interface.

1 39. A diaper as in claims 31 or 38, further
2 including a central fingerlift to enhance layer
3 separation, said release element including said at least

4 one mounting portion and an adjacent surface portion that
5 is free of said securement portion and substantially
6 unattached to said fastening element, said at least one
7 securement portion terminating at a separation joint to
8 form said fingerlift with said adjacent mounting surface
9 portion, movement of said tab to said deployed position
10 also including peeling said fastening element from said
11 release element in said lengthwise direction across said
12 adjacent surface portion.

1 40. A diaper as in claim 31, wherein said tab
2 includes first and second film layers having remote outer
3 faces and adjacent inner faces releasably joined together
4 along said separation interface, said film layer outer
5 faces being respectively secured to said fastening and
6 release elements, and, upon tab deployment, said inner
7 faces providing said non-adhesive surfaces.

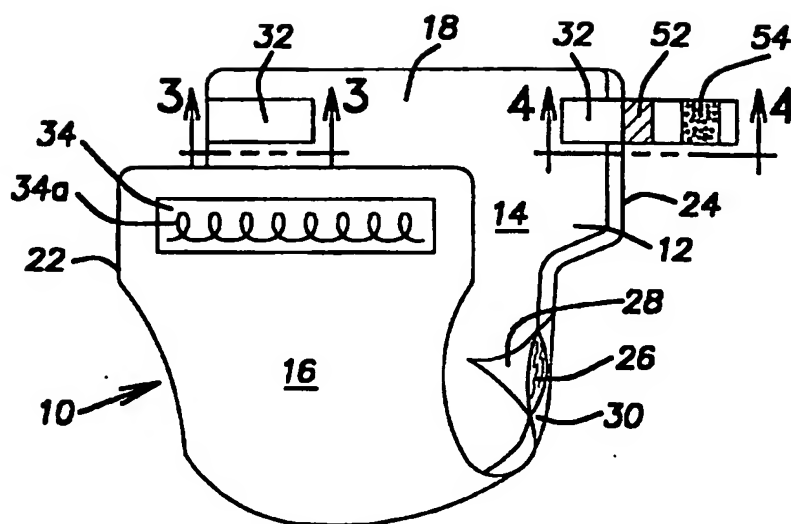


Fig.1

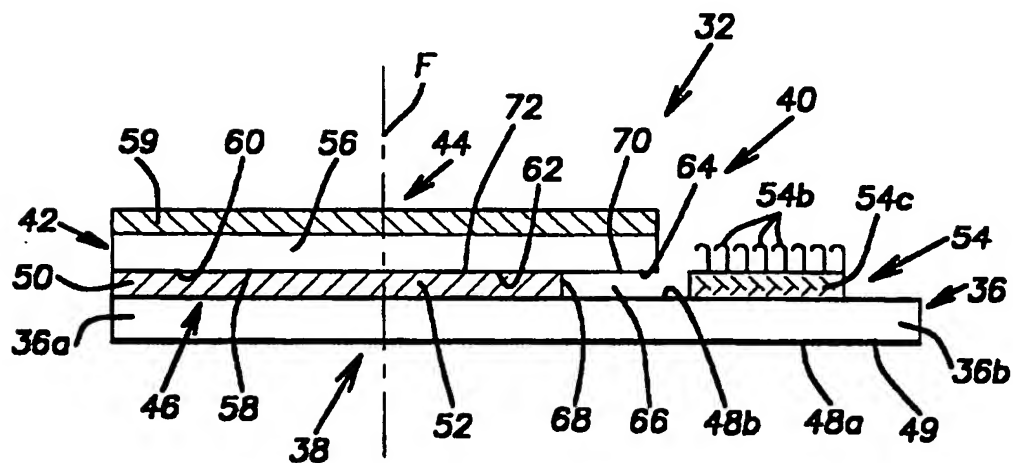


Fig.2

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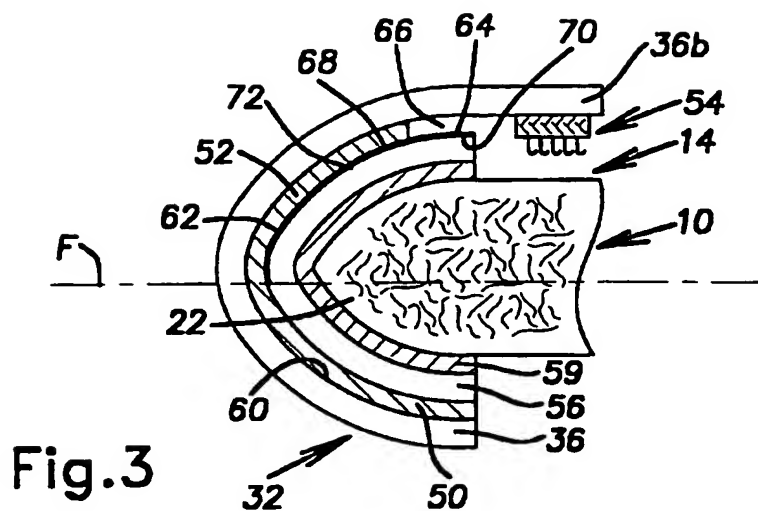


Fig. 3

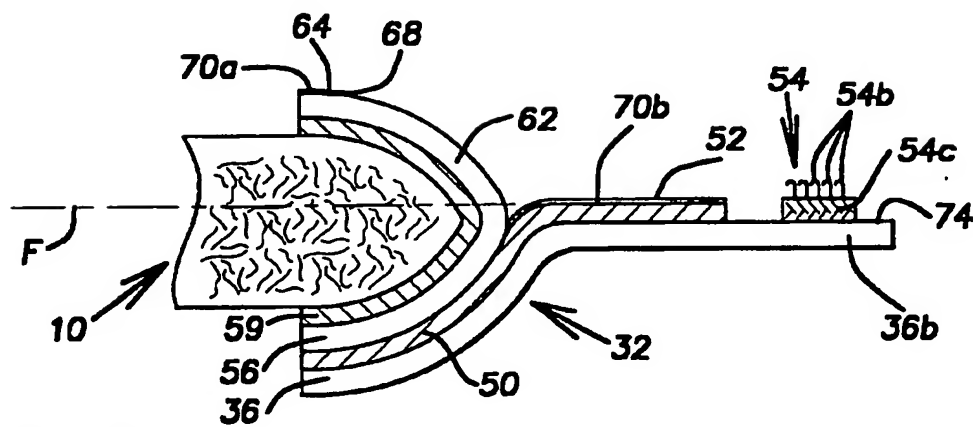


Fig. 4

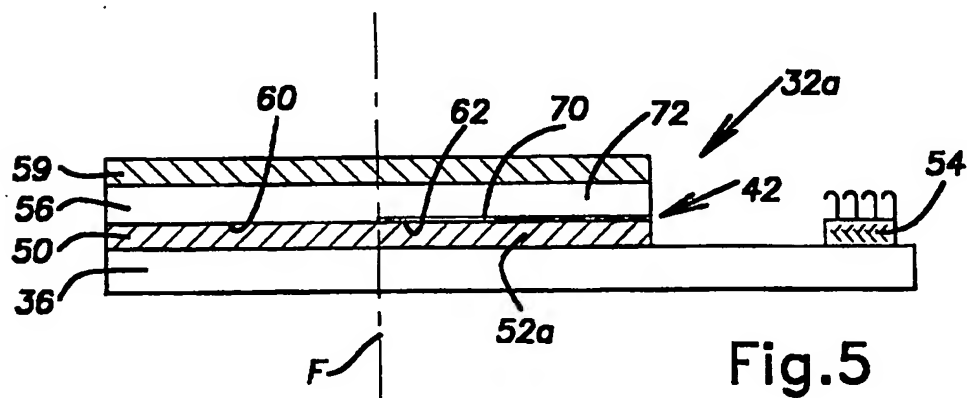


Fig. 5

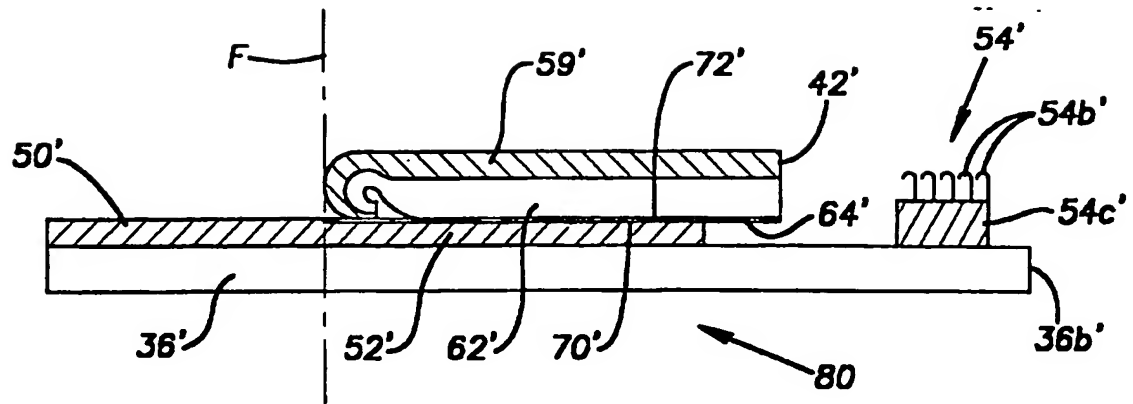


Fig. 6

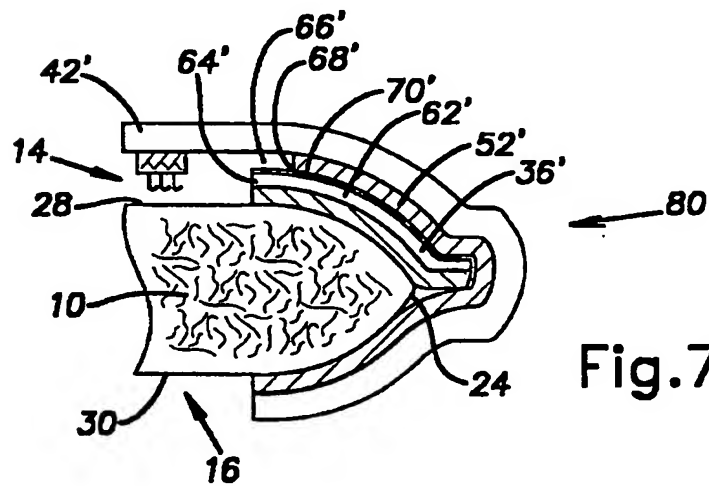


Fig. 7

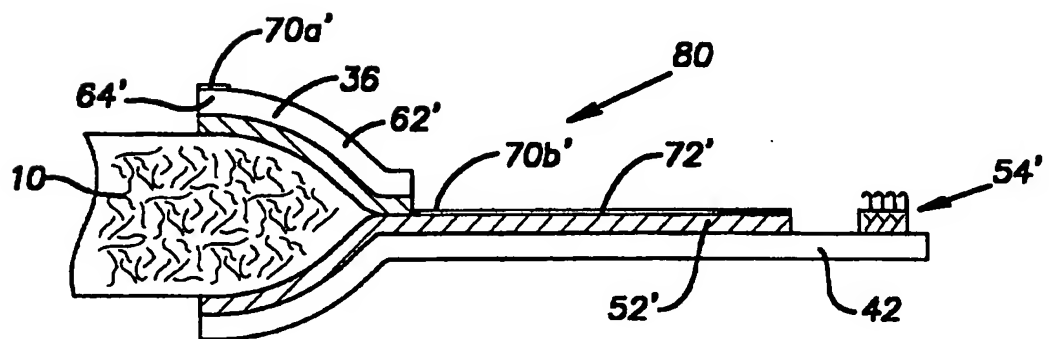


Fig. 8

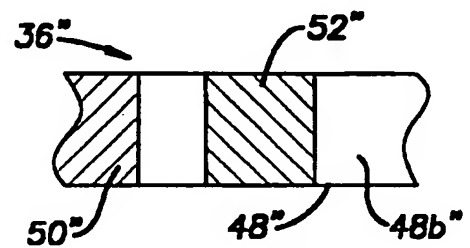
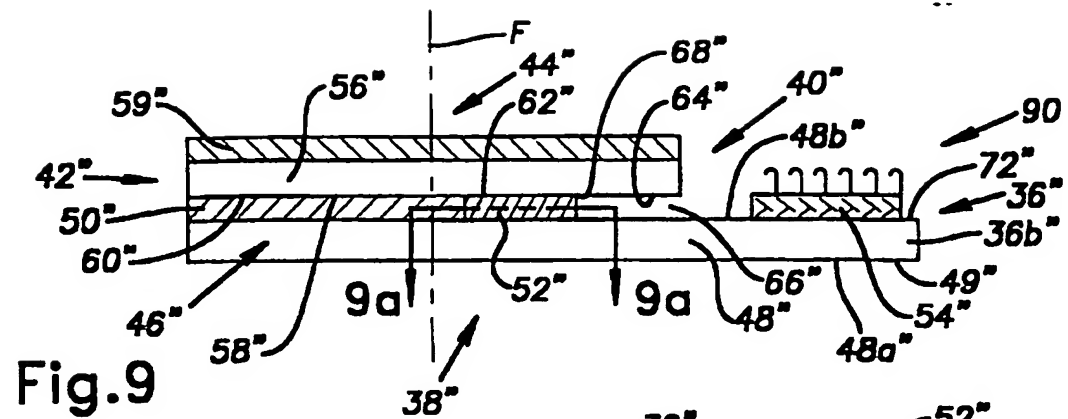


Fig.9a

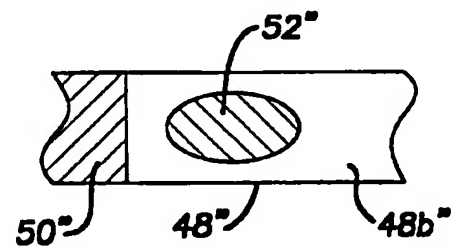
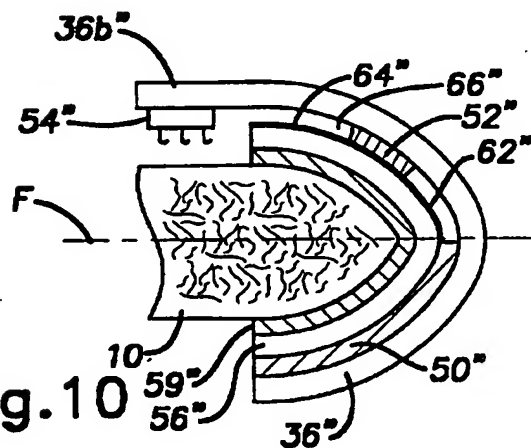
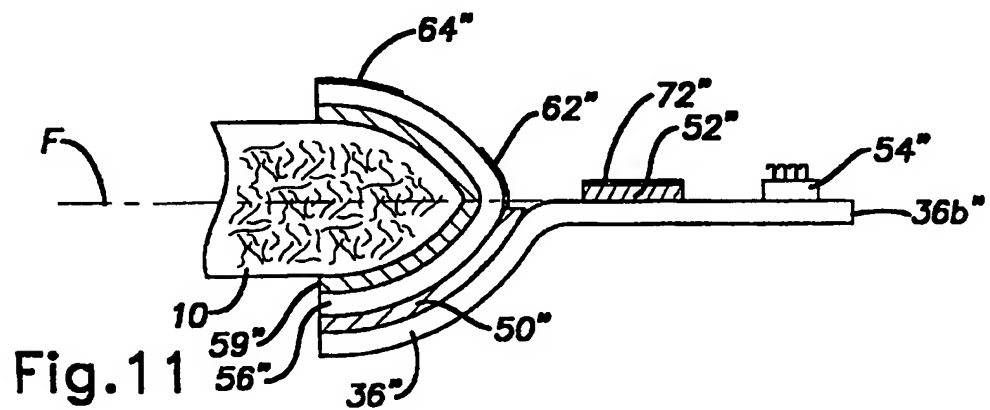


Fig.9b



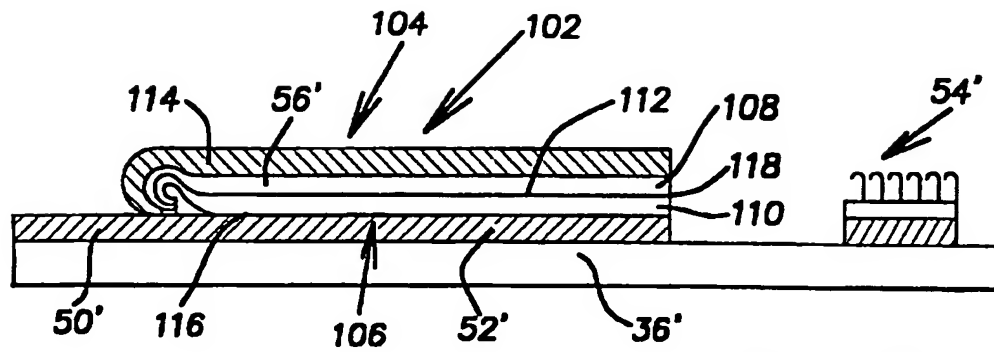


Fig. 12

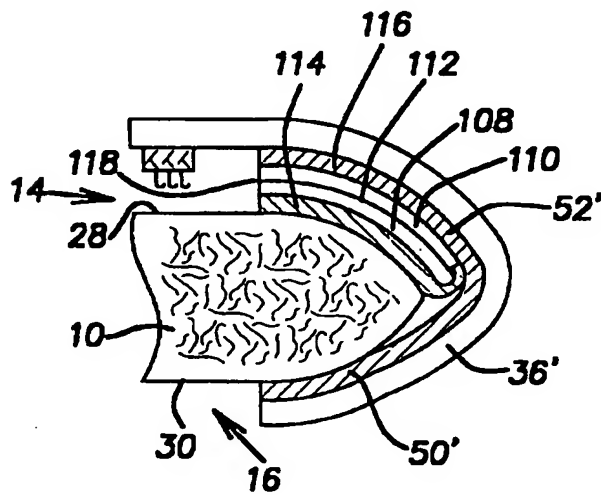


Fig. 13

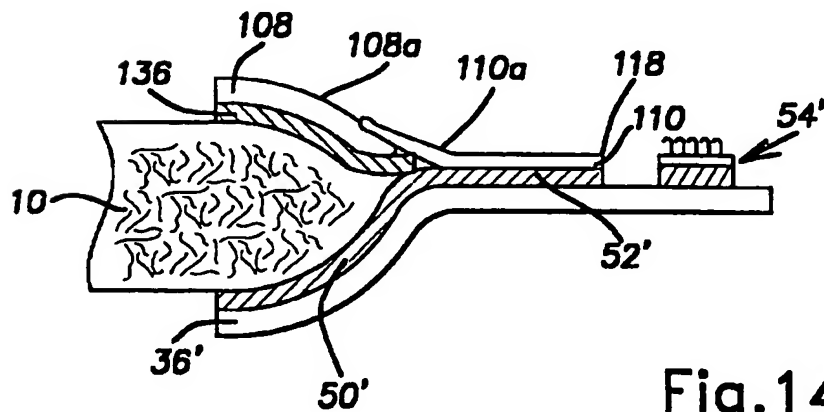


Fig. 14

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/01738**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) :A61F 13/15

US CL :604/391

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 24/306, 402; 428/40.1, 41.8, 42.2; 604/389-391

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 92/21309 A (DHONDT et al.) 10 December 1992, entire document.	1-40

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	* T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
* A document defining the general state of the art which is not considered to be of particular relevance	* X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
* E earlier document published on or after the international filing date	* Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, each combination being obvious to a person skilled in the art
* L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	* G document member of the same patent family
* O document referring to an oral disclosure, use, exhibition or other means	
* P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

04 APRIL 1997

Date of mailing of the international search report

01 MAY 1997

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